PATENT ABSTRACTS OF JAPAN

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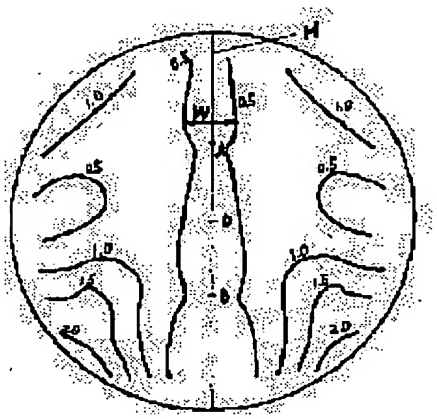
(54) PROGRESSIVE MULTIFOCUS LENS AND SPECTACLES

(57)Abstract:
PURPOSE: To provide a progressive multifocus lens and spectacles suitable for visual operations mainly for middle and short distances.
CONSTITUTION: A) The gradient G of the refracting power on a central reference line M between a center A for far sight and a center B for near sight satisfies the relation G≤ADD/20 (dioptry/m) and B) the lens has the bright viewing region defined by the conditions (n−1)× |C1−C2|≤0.5m(m−1) inclusive of the central reference line M in the far sight part region existing upper than the center A for far sight and satifies the relation that the max. width of the bright viewing region of the near sight part region does not exceed four times the min. value of the bright viewing area of the intermediate part region.



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1.This document has been translated by computer. So the translation may not reflect the original precisely.
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CLAIMS

[Claim(s)]
[Claim 1] It sets to at least one lens refracting interface between two refracting interfaces which constitute a lens. In the progressive multifocal lens to which it has the guide-center line which is extended in the vertical direction of this lens refracting interface, and kicks this lens refracting interface independently right and left, and the predetermined degree of subscription is added between the center for ** on this guide-center line, and the center for ** A) The inclination G of the refraction mosquito on the guide-center line between the center for ****** and the center for ****** is G<=ADD/20 (a DIOPU tree / mm).
the clear vision zone defined according to the following conditions including the aforementioned guide-center line in the distance point field in which ****** is filled and it is located more nearly up than the center for B ****** -- having -- x(n-1) |C1 1 -- C2 |<=0.5 (m-1)
And the maximum width W of this clear vision zone is 5<=W<=30 (mm).
The progressive multifocal lens characterized by filling ******. (However, ADD is the degree of subscription and DIOPUTORI R shows [a unit / the refractive index C1 of a lens material, and C2] the principal curvature (a unit is m-1) in the point on a lens refracting interface, respectively.)
[Claim 2] The inclination G of the aforementioned refractive power is G<=ADD/25 (a DIOPU tree / mm).
******** -- the claim characterized by things -- a progressive multifocal lens given in the 1st term
[Claim 3] the aforementioned NO aforementioned guide-center line top in a distance point field -- setting -- 0.2 <=(n-1) x|C1 1 -- C2 |<=0.3 (m-1)
The ******** principal curvature C1 and C2 Progressive multifocal lens given in the 1st term of a patent claim characterized by having and there being the direction of the maximum principal curvature horizontally among these principal curvatures mostly.
[Claim 4] the aforementioned guide-center line top in the aforementioned distance point field -- setting -- 0.2 <=(n-1) x|C1 1 -- C2 |<=0.3 (m-1)
The ******** principal curvature C1 and C2 Progressive multifocal lens given in the 2nd term of a patent claim characterized by having and there being the direction of the maximum principal curvature horizontally among body principal curvatures mostly.
[Claim 5] A progressive multifocal lens given in the 1st term of a patent claim to which maximum of the clear vision zone of the aforementioned distance point field and maximum of the clear vision zone of the aforementioned reading point field are characterized by not exceeding 4 times of the minimum value of the clear vision zone of the aforementioned pars intermedia field.
[Claim 6] A progressive multifocal lens given in the 2nd term of a patent claim in which the maximum of the clear vision zone of the aforementioned distance point field and the maximum of the clear vision zone of the aforementioned reading point field ****** not exceeding 4 times of the minimum value of the clear vision zone of the aforementioned pars intermedia field.
[Claim 7] It sets to at least one lens refracting interface between two refracting interfaces which constitute a lens. In the spectacles which used the progressive multifocal lens to which it has the guide-center line which is extended in the vertical direction of this lens refracting interface, and kicks this lens refracting interface independently right and left, and the predetermined degree of subscription is added between the center for ** on this guide-center line, and the center for ** For the aforementioned progressive multifocal lens, the inclination G of the refractive power on the guide-center line between the center for A ****** and the center for ****** is G<=ADD/20 (a DIOPU tree / mm).
the clear vision zone defined according to the following conditions including the account guide-center line of a paragraph in the distance point field in which ****** is filled and it is located more nearly up than the center for B ****** -- having -- x(n-1) |C1 1 -- C2 |<=0.5 (m-1)
And the maximum width W of this clear vision zone is 5<=W<=30 (mm).
Spectacles characterized by carrying out frame ON processing so that ****** may be filled and an eye

point may come in the direction of the center for ****** to 5mm or the position distant 15mm from the center for ****** on the aforementioned guide-center line. (However, ADD is the degree of subscription and DIOPUTORI n shows [a unit / the refractive index C1 of a lens material, and C2] the principal curvature (a unit is m-1) in the point on a lens refracting interface, respectively.)
[Claim 8] The inclination G of the aforementioned refractive power is G<=ADD/25 (a DIOPU tree / mm).
******** -- the claim characterized by things -- glasses given in the 7th term
[Claim 9] the aforementioned guide-center line top in the aforementioned distance point field -- setting -- 0.2 <=(n-1) x | C1 1 -- C2 | <=0.3 (m-1)
The ******** principal curvature C1 and C2 Spectacles given in the 7th term of a patent claim characterized by having and there being the direction of the maximum principal curvature horizontally among these principal curvatures mostly.
[Claim 10] the aforementioned guide-center line top in the aforementioned distance point field -- setting -- 0.2 <=(n-1) x | C1 1 -- C2 | <=0.3 (m-1)
the ******** principal curvature C1 and C2 the claim which ****** that it has and there is the direction of the maximum principal curvature horizontally among these principal curvatures mostly -- spectacles given in an octavus term
[Claim 11] Spectacles given in the 7th term of a patent claim to which maximum of the clear vision zone of the aforementioned distance point field and maximum of the clear vision zone of the aforementioned reading point field are characterized by not exceeding 4 times of the minimum value of the clear vision zone of the aforementioned pars intermedia field.
[Claim 12] Spectacles given in the patent claim octavus term to which maximum of the clear vision zone of the aforementioned distance point field and maximum of the clear vision zone of the aforementioned reading point field are characterized by not exceeding 4 times of the minimum value of the clear vision zone of the aforementioned pars intermedia field.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the structure of the spectacles which used the structure and its progressive multifocal lens of a refracting interface of the progressive multifocal lens used in order that ****** people may mainly compensate a presbyopia with it.
[0002] [Outline of invention] In a progressive multifocal lens, this invention makes the inclination of the subscription frequency of ****** loose enough at the guide-center line of a progressive multifocal lens, and also suppresses the astigmatism on the line small, and is a clear vision zone in a distance point field (portion of 0.5Dptr or less of astigmatism.) further. It mentions later for details. By making width of face small sharply conventionally, it has a large good visual field in a pars intermedia field, and the shake of an image also realizes a few progressive multifocal lens. Moreover, by defining the eye point at the time of frame ON processing in the direction of the center for Kon from the center for ** on a guide-center line in the spectacles which used the lens in 5mm or the position distant 15mm, the spectacles suitable for ****** in inside and a short distance are realized.
[0003]
[Description of the Prior Art] A progressive multi-focal lens is explained first.
[0004] A progressive multi-focal lens is developed in order to compensate the fall of the adjustment function of the lens of the eye in elderly people, and the fundamental structure is the following intermediary ****.
[0005] The convex refracting interface is carrying out the work which gives the refractive power of the lens suitable for having partially different field refractive power and seeing from a distant thing to a thing at hand among the refracting interfaces of the couple of the convex which constitutes a progressive multifocal lens, and a concave surface, and a concave refracting interface is doubled with prescription of each eye of a spectacles user, and is carrying out ****** which corrects the myopia, hyperopia, the astigmatism, etc. Although it is also possible to make it **** which made the work by the convex and the concave surface change, the above-mentioned structure is taken by - ** for the reason of the ease of carrying out of manufacture etc. Many methods are indicated by JP,49-3595,B, the Japanese Patent Publication No. 52 1 No. 20271 official report, the Japanese-Patent-Application-No. 54 1 No. 41915 official report, the Japanese-Patent-Application-No. 55 1 No. 171569 official report, the Japanese-Patent-Application-No. No. 175601 [55 to] official report, etc. about the composition of the refracting interface. If explanation is further added about the structure of the convex refracting interface which is the feature of a progressive multifocal lens, the refracting interface can carry out a field division about like drawing 2 . 1, 2, and 3 in drawing are a portion which is called a distance point field, a pars intermedia field, and reading point ****, is suitable for ****** (it **** 1m of ****** and a long distance thing is seen from 2m), the Nakama ** (and the thing between 1m or 2m is seen from 50cm), and ****** (and a front thing is seen from 50cm), respectively, and gives refractive power to a lens, respectively. M of drawing was called guide-center line, is extended in the vertical direction in the center of a simultaneously of a lens, and divides the lens into right and left. The "main meridian" and when dividing this guide-center line into a bilateral symmetry, and that is not right, it may be called [as shown in this drawing,] a "main gaze line." The guide-center line has achieved the important role rate on the structure of the refracting interface of a progressive multifocal lens. That is, on the guide-center line, refractive power (correctly field refractive power) is changing like drawing 3 , and the fundamental function of a progressive multifocal lens is brought about. This drawing expresses the position on a guide-center line to a vertical axis, and expresses refractive power to a horizontal axis. As [B point / the portion and B point / of the upper part A points] shown in this drawing, it is increasing from A points gradually, applying it to the B point, and it carries out only certain / about 1 / and small change in a downward portion. Like [the joints A and B of change of this refractive power are called in the center for **, and the center for **, respectively, and] drawing 2 , a distance point field can be considered from A points, and a reading point

field and the portion of these between can be considered [the upper part] to be pars intermedia fields for a lower part from the B point. Of course, on the refracting interface of a progressive multifocal lens, refractive power is changing continuously and cannot divide the three above-mentioned fields clearly. However, when considering the structure of a lens, generally the view of a field division is adopted as an effective means.

[0006] The increment of the refractive power added between this center for ** and the center for Kon is called degree of subscription. Generally as for the degree of subscription, the value from 0.5Dptr for an elementary presbyopia (it is hereafter described as D) to 3.5D for a strong presbyopia is taken.

[0007] the curvature C (a unit is m-1) and the following relations to the front face -- with, it is [refractive power / the refractive power S on the front face of a lens /, i.e., field refractive power,]

[0008] S=(n-1) xC (DEIOPU tree)

n is the refractive index of a lens material here. Since the refractive index of a lens material is fixed, curvature and field refractive power have a proportional relation. Therefore, it can be considered that drawing 3 is change of the curvature of a guide-center line. Thus, it applies to a reading point field from a distance point field, and the convex side front face of a successive promotion multifocal lens since curvature is changing in the guide-center line of a lens which runs a center mostly is an aspheric surface configuration and intermediary ****. Therefore, a value changes with directions and the curvature in one on the front face is the greatest thing C1 of the curvature. According to the difference of the minimum thing C2 (these are called principal curvature), the difference of the field refractive power shown by the following formula arises at the point on the lens front face.

[0009]

(n-1) x | C1 1C2 | (DEIOPU ** Lee)

This appears as astigmatic on the optical-character ability of a lens. Therefore, astigmatism is used in the sense of the difference of this field refractive power into this specification below. Drawing 4 expresses the astigmatic distribution in the conventional progressive multifocal lens. This drawing is what expressed astigmatism by the contour line of a map, and astigmatic lines [appearance / this], and it is shown that the narrower thing of the pitch of hatching has larger astigmatism. The astigmatic line which is drawing, such as being the smallest, is an astigmatic line of 0.5D, and the white portion in drawing is a portion whose astigmatism is below 0.5D. Since a this 0.5 or less astigmatism portion can be seen without feeling ****** of an image when a word intermediary and a thing are seen experientially, it is called clear vision zone. In addition, it is expressed with the following formula when a clear vision zone is correctly defined as a configuration of a lens refracting interface.

[0010]

(n-1) x | C1 1 -- C2 | <=0.5 (m-1)

It is C1 and C2 here. It is the curvature expressed with the unit of m-1 in each point on the lens refracting interface within a clear vision zone, and n is the refractive index of a lens material.

[0011] M, A, and B in drawing correspond with the thing of drawing 2 , and are a guide-center line, a center for **, and a center for Kon, respectively. this drawing -- like -- a progressive multifocal lens -- the side of a lens -- the side of a portion especially a pars intermedia field, and a reading point field -- many astigmatism occurs into a portion On a visual sense, it is perceived noting that an image should complain of this astigmatism, and on the other hand, it is perceived as a shake of the image when moving the head, since an image can distort in this portion, is on use and gives displeasure. Therefore, although losing is desirable as for this astigmatism, the basic structure top of a progressive multifocal lens is impossible. That is, if it is going to abolish the astigmatism of the portion, for example by making a distance point field and a reading point field into the perfect spherical surface, in the pars intermedia field which puts smoothly a distance point field with the different curvature, and a reading point field in a row, it will be obliged to a rapid change of a configuration, and extremely big astigmatism will occur in the field. conversely, the clear vision zone of a distance point field and a reading point field -- narrow -- carrying out -- the side -- if a portion is made to diffuse astigmatism, although the astigmatism in a pars intermedia field will decrease and what [image / latus / of a visual field] has a few shake will be made in the Nakama **, ****** and ****** will be spoiled Thus, since there cannot be no lens of the astigmatic few ideal which is the defect in a progressive multifocal lens, it is necessary to design a lens so that the evil astigmatically depended to the purpose of using ****** and each wearing person may decrease. In view of this viewpoint, the progressive multifocal lens developed by present is divided roughly into two types as shown in drawing 4 and drawing 5 .

[0012] Drawing 4 is the conventional progressive multifocal lens which set importance equally to ****** and ****** first. When explanation is added about the structure, the length (this section AB is called progressive section and the length is called length of the progressive section) of the section AB which has added the degree of subscription on a guide-center line is usually 12-16mm. This is because it cannot do

not much long, when winding of the eyeball in the time of ****** and ****** is taken into consideration. When the width of face in about at least 40mm horizontal direction turns its eyes to a longitudinal direction, it is clearly made seen [the clear vision zone of a distant place section field / width of face]. although the width of face of the clear vision zone of a reading point field changes with the degree of subscription -- the thing of degree of subscription 2.00D -- it is -- horizontal width of face of 10mm - about 15mm -- with, it is therefore, the clear vision castle of a pars intermedia field is mostly determined as the inclination of the refractive power in the progressive section -- having -- the thing of degree of subscription 2.00D -- usually -- horizontal width of face of 3mm - 5mm -- with, it is

[0013] On the other hand, drawing 5 is the astigmatic view of the progressive multifocal lens indicated by Japanese Patent Application No. 58-170647. For this lens, the thing of a type since it is designed with emphasis on ****** and the Nakama **, as shown in drawing 4 till then is different **** structure and intermediary ****. namely, the thing for which the length of the progressive section is lengthened with 18mm or more, and the inclination of refractive power is made small -- the clear vision zone of pars intermedia -- large -- the clear vision zone of a ****** cage and a distance point field -- the side of a lens -- up to an edge -- large -- ********** the width of face with the clear vision zone of a reading point field horizontal on the other hand -- it of a pars intermedia field -- ****** -- it is a large grade

[0014] the above -- two types, i.e., drawing 4 , -- like -- both ****** and ****** -- importance -- placing -- the whole -- balance -- ****** -- a thing (this type is hereafter called type among **) with emphasis on a standard thing (this type is hereafter called standard type), ****** like drawing 5 , and the Nakama ** is the type of a design seen from the purpose of using the conventional progressive multifocal lens

[0015] A progressive multifocal lens is described about ****** spectacles below.

[0016] Although ****** processing is carried out to the ball type configuration of a frame and a circular lens like drawing 4 is ******(ed) on a frame when creating spectacles, an eye point needs to come to the right position in that case. An eye point is a passage position on the lens of a visual axis when the spectacles wearing person is looking at the distant place with the natural posture, and it may be called the fitting point. The position of this eye point needs to be especially set up correctly in a progressive multifocal lens. because, as having already explained the progressive multifocal lens -- the position on a lens -- therefore -- frequency -- changing -- moreover, an original astigmatic distribution -- with, since it is, an original performance is not demonstrated unless an eye point is set up correctly Drawing 6 is the front view showing the structure of the spectacles which used the conventional progressive multifocal lens, and the dashed line shows the clear vision zone. With this conventional kind of spectacles, as shown in this drawing, it is set as the position which the eye point E made in agreement with the center A for **, or (thing of drawing 6 (a)) was separated from the center for ** up about 2-4mm (thing of drawing 6 (b)). In addition, drawing 6 (a) is the example of what was designed by the bilateral symmetry to the guide-center line, and about 10 degrees of guide-center lines are leaned, and it is ******(ed) so that the center B for Kon may come to a nose side from the center A for ** to compensate for convergence of an eye, as shown in drawing. Drawing 6 (b) is an example in that by which the guide-center line was beforehand bent and was designed in consideration of convergence, and it is not necessary to lean it in this case at the time of ******. In addition, there is no correlation in the setting position of the existence of the symmetric property in a design, and an eye point.

[0017] When a transverse plane is seen with a natural posture, an eye point is set as the position of the **** upper part from the center for **, or it because it is required in a life usual in ****** being made. For that purpose, it is set up near the center for ** in a distance point field as a position where winding of an eye does not become large too much at the time of ****** and ******. This is the same also in the progressive multifocal lens of a type among **.

[0018]

[Problem(s) to be Solved by the Invention] As stated previously, the progressive multifocal lens should be designed so that it may be most suitable for the purpose according to the purpose of use, and there may be if possible little trouble. the machine tool work of the medical operation of the work whose progressive multifocal lens in the meaning made the subject the thing of middle distance and a short distance, for example, writing, surgery, etc., an engine lathe, etc. -- ** -- an intermediary -- sufficient thing -- it is -- inside **** Because, for a distance point field and a reading point field, it is hard to carry out the Nakama ** by sensibility which is being seen from the crevice between doors in that by which a pars intermedia field is especially narrow and the degree of subscription exceeds 2.5D although it is easy to use in order that a clear vision zone may be large, and shift of the visual axis from ****** to ****** may also have little winding of an eye and may end, and a standard type thing is ******. Moreover, the fault that ****** is seldom in it from an eye point since a reading point field is [being a long distance and] narrow although the clear vision zone of a distance point field is very large in the thing of a type among ** and ****** and the Nakama ** are good compared with the standard type thing of the clear vision zone of a

pars intermedia field for a latus reason is ******.
[0019] this invention offers the progressive multifocal lens and spectacles suitable for ****** which made - short distance the subject while canceling such a fault.
[0020]
[Means for Solving the Problem] The following conclusions were obtained as a result of adding examination about a progressive multifocal lens about the various factors which determine the performance with a conventional progressive multifocal lens and the conventional lens made as an experiment newly.
[0021] In order to make the clear vision zone of a pars intermedia field into what it is easy to use widely first, it is the inclination G of the refractive power on the guide-center line in this field G<=ADD/20 (a DEIOPU tree / mm)
It carried out. ADD is the degree of subscription of a lens here. By the size of the clear vision zone of a pars intermedia field adhering to the degree of subscription, although it was better as small [that there is nothing], as a result of taking both balance into consideration, a relation like a top formula was obtained from the need of attaining the desired degree of subscription in SU **-SU to which spectacles were restricted. Moreover, it sets to that to which the degree of subscription of spectacles prescription of a user exceeds 2.5D by case like a surgical operation where especially the Nakama ** is needed, and is G<=ADD/25 (a DEIOPU tree / mm).
It is desirable to fill ******.
[0022] furthermore, the indispensable visual field at the time of ****** -- securing -- and the side of a staging area -- in order to make the astigmatism in a portion small, the following conditions were given to the horizontal maximum width W of the clear vision zone of a distance point field
[0023] 5<=W<=30 (mm)
Therefore, astigmatism was spread in the distance point field in this, and the astigmatism in the side of the part and a pars intermedia field was able to be reduced sharply.
[0024] the grade for which, as for W, ****** is needed, as for a value, and a pars intermedia field -- the astigmatic grade permitted in the side needs to determine within the limits of an upper formula what there is dissatisfaction of the wearing person who receives the size of ****** in what has the portion smaller than about 5mm according to the trial production wearing test which hits this invention which can do ******, and exceeds about 30mm -- pars intermedia -- ******** of the visual field of the side, and a certain ** -- a shake -- receiving -- the dissatisfaction -- ******
[0025] Moreover, when a latus visual field is especially required in a distance at hand from middle distance, it is effective to attach the astigmatism of 0.2 or 0.3D which has the maximum refractive power horizontally mostly on the guide-center line of a distance point field. That is, the astigmatism of a pars intermedia field can be further reduced by diffusing the astigmatism in a distance point field even on a guide-center line. Moreover, if astigmatic, there is also almost no thing of this level for which ****** of an image is sensed at the time of ******.
[0026] Moreover, it is ****** that conditions are required between each clear vision zones of a distance point field, a pars intermedia field, and a reading point field when requiring the little [image / especially in a pars intermedia field] of a shake. Namely, it is effective to set up so that the horizontal maximum width of the clear vision zone of a distance point field and the horizontal maximum width of the clear vision zone of a reading point field may not exceed 4 times of the minimum width of face of the clear vision zone of a pars intermedia field, and it is ******. An astigmatic distribution in the side of the lens which therefore results in this condition from a distance point field to a pars intermedia field and a reading point field is smooth, and becomes the loose thing of change, and the shake of an image becomes small. In addition, it is desirable that the ratio of the width of face of an above-mentioned clear vision zone makes it the grade which does not exceed 3 times in a big thing which exceeds degree of subscription 2.5D although it may be large what has the small degree of subscription since the shake is small from the first.
[0027] In the spectacles which, on the other hand, used this progressive multifocal lens, since it should be easy to carry out the Nakama ** and ******, eye POIN ** does not have 5mm than the center for **, and spectacles were created so that it might come on a guide-center line caudad 15mm. Thus, when the transverse plane of a face is seen by creating spectacles, the number of power of lenses becomes the Nakama ** with a ****** thing, and it becomes easy to carry out the Nakama **. moreover, ****** -- also setting -- the lens of this invention -- the inclination of the refractive power on a guide-center line -- small -- writing -- an intermediary with a long distance of the center for ** to the center for Kon -- the position of the end and the conventional eye POIN ** -- a reading point field -- extremely -- caudad -- a line intermediary -- the end of most -- although ****** becomes difficult, ****** is possible by turning a visual axis caudad like the almost conventional progressive multifocal lens by setup of the above eye points

Moreover, the position of an eye point is determined according to the need for ******, and it is necessary to set it as the main approach for **, so that need is high.
[0028]
[Embodiments of the Invention] An example explains the progressive multifocal lens of this invention in detail.
[0029] Drawing 1 (a) and (b) show the astigmatic distribution of the progressive multifocal lens which is the 1st example of this invention, and change of the refractive power on a guide-center line, respectively. In this drawing, M is [the center for ** and B of a guide-center line and A] the centers for Kon. The number in drawing of drawing 1 (a) expresses the astigmatic size of each ** astigmatic line with the unit of DEIOPUTORI. this example -- the degree of subscription -- the thing of 2.0D -- it is -- the center A for **, and the center B for Kon -- geometrical center O of a lens -- respectively -- 10mm upper part and l -- there is 5mm caudad Change of the refractive power in the progressive section on the guide-center line M is changing almost linearly, as shown in drawing 1 (b), and the refractive-power inclination G is G= 2.0 / 25= 0.08 (D/mm).
It comes out. In addition, change of the refractive power of the progressive section of the example of this invention which comes out below is almost linear, and omits explanation. Moreover, on a guide-center line, astigmatism is zero. That is, a guide-center line is an umbilicus curve. There is about 18mm of the horizontal maximum width W of a distance point field.
[0030] The astigmatic distribution of the conventional progressive multifocal lens is shown in drawing 10 for this lens and comparison. As for the degree of subscription of this lens, addition of refractive power is carried out to the simultaneously straight-line target with 16mm **, as for the length of 2.0D and the progressive section. Therefore, the refractive-power inclination G in the progressive section is G= 2.0 / 16= 0.125 (D/mm). Moreover, the astigmatism on a guide-center line is zero, and the horizontal maximum width W of a distance point field is 42mm. In addition, the horizontal maximum width of the clear vision zone in a reading point field of the thing of this invention and this conventional thing is also the same, and is about 12mm.
[0031] The feature of the progressive multifocal lens of this invention is that the inclination of the refractive power on the guide-center line in the progressive section is [the horizontal maximum width of the clear vision zone in a distance point field] quite small quite small compared with the former like the above. The effect brought about according to these features can be seen in a pars intermedia field. that is, if drawing 1 (a) is compared with drawing 10 , compared with the conventional thing, the astigmatism of a pars intermedia field is alike and small [the thing of this invention] so that clearly When the horizontal width of face of the clear vision zone of a pars intermedia field is compared in drawing 1 (a) and drawing 10 , about 7mm and the conventional thing of the thing of this invention are as large as about 5mm about 40%. moreover, the side of the lens which lasts to a reading point field from a pars intermedia field -- the thing of the former [astigmatism / in a portion] is decreasing to being 2.5D as sharply / the thing of this invention / as 1.5D as [show / like before / in the Nakama ** / therefore, / according to this invention / from the crevice between doors] -- sensing -- coming out -- the latus visual field which is not is acquired and shift of the visual axis to ****** also serves as a smooth and natural visual field from the Nakama **
[0032] Moreover, it is about 2.3 times and 1.5 times the ratio of the width of face of the clear vision zone of the distance point field to the width of face of the clear vision zone of a pars intermedia field, and a reading point field of this, respectively, and it is extremely small compared with they in the conventional example being about 8.4 times and 5.4 times. this is also the feature of this invention and makes small the vena contracta of the clear vision zone in a pars intermedia field in this way -- a staging area like before -- it eases that astigmatism concentrates on the side and the shake of an image becomes small as a result
[0033] Drawing 7 is drawing showing the astigmatic distribution of the progressive multifocal lens of the 2nd example of this invention. The degree of subscription of this example is 2.0D as well as the 1st example, and the center A for ** and the center B for Kon are from geometrical center O of a lens on 15mm guide-center line of the upper part and 15mm lower part, respectively.
[0034] The horizontal maximum width W of the clear vision zone of a distance point field is about 10mm. Unlike the 1st example, on a guide-center line, astigmatism exists partially. That is, in a distance point field, there is astigmatism of 0.25D which has the maximum refractive power horizontally mostly, it applies from the center for ** in a pars intermedia field focusing on the object for Kon, the astigmatism decreases almost linearly, and astigmatism is zero in zero, an intermediary cage, and a reading point field at the center for Kon. The horizontal maximum width of the clear vision zone of a reading point field is about 14mm.
[0035] At this example, as a result, the horizontal width of face of the clear vision zone of a pars

intermedia field spreads, it is further improved by both sides of the shake of the size of a visual field, and an image by the Nakama **, and the refractive-power inclination G in the progressive section is [an intermediary cage still smaller than G= 2.0 / 30= 0.067 (D/mm) and the 1st example and] ******. moreover, the form where width of face spreads as the above astigmatism occurs also in the progressive section naturally and the clear vision zone of a pars intermedia field approaches a reading point field by having scored astigmatism on the guide-center line of a distance point field -- it becomes easy to perform ****** rather than an intermediary cage and the 1st example by being ****-like from the Nakama ** Especially the lens of this example has set the use as short-distance work into and, therefore width of face of a distance point field is sharply narrowed from the 1st example, and improvement of the Nakama ** is achieved. The width of face of the clear vision zone of a pars intermedia field is about 5mm most narrowly near [for **] a center, and is about 12mm most widely under 5-8mm based on geometrical. Also in this example, the ratios of the maximum width of the clear vision zone of the distance point field to the minimum width of face of a pars intermedia field and a reading point field are 2.0 and 2.4 times, respectively, and make the vena contracta in the pars intermedia field of a clear vision zone less than 3 times.

[0036] Drawing 8 is drawing showing an astigmatic distribution of the progressive multi-focal lens of the 3rd example of this invention. This example is the thing of degree of subscription 2.5D, and the position of the center for ** and the center for ** is the same as the thing of the 1st example. On a guide-center line, astigmatism is zero. Moreover, the width of face W of a distance point field is about 13mm, and the horizontal width of face of a reading point field is about 12mm.

[0037] Drawing 11 shows the astigmatic distribution of the conventional progressive multifocal lens for comparing with this example. For the degree of subscription of the lens shown in this drawing, the length of 2.5D and the progressive section is [the width of face of 40mm and a reading point field of the width of face W of 16 and mm distance point field] about 12mm. Moreover, the astigmatism on a guide-center line is zero.

[0038]